4. The shelter of the observer can then be quite detached from and independent of the telescope.

In the description of the floating polar axis referred to above, I mention its suitability for that disposition where one large and one small mirror is used.

My reason for not then mentioning the second disposition (that in which two large plane mirrors are used, one of these being perforated) to which this polar axis is most particularly adapted, was fear of stepping too far at once, as, apart from the additional difficulty of making a large plane perforated mirror, there seemed to me to be an element of risk and uncertainty in its use. After reading this article by M. Lœwy, I think there may not be much in my objections, but I cannot quite satisfy myself. In dealing with the support of the large plane mirror in the disposition that I allude to in the description of the polar axis, I contemplated such an arrangement for it as I have in use with my three-foot mirrors, this answering, as far as I have been able to see, perfectly, in eliminating flexure, and as the back of this large plane mirror would never wholly leave its supports, there would not be any fear of flexure here; the other mirrors offer no difficulty as they are practically as in an ordinary *Newtonian* telescope. The support of the large plane perforated mirror, when used for any latitude higher than 45°, is not easily obtained; it must rest on a rim touching the face all round, hence unless it could be hung up from the back in some way it might bend down and spoil the image.

It may be that the slight angle it would make would not bring in flexure of an injurious kind, and this could be determined by actual experiment beforehand, but at present it is an open question.

If it is not a difficulty, then I should agree with M. Lœwy that this is the best disposition for many reasons—it dispenses with the supports of the small mirror that cause diffraction rays, not objectionable to the observer except on bright objects, but very much so in a photograph, where they can impress themselves from an eighth or ninth magnitude star with any exposure that would be used for a nebula; it gives better support to the concave mirror: difficulties in connection with the reversal of the instrument do not come in with such force, and, most important of all, with such a polar axis as I have described, the focal plane might be kept very close behind the large perforated mirror, giving advantages of the greatest importance from many points of view.

The covering of the mirrors by a plate of glass has already been suggested and tried, but in a way that determined nothing. It is a capital thing to do; only experiment could really decide. Certainly flexure could be got over by air pressure, and it would be worth any trouble to get it, if not injurious to the image.

Ealing, August A. AINSLIE COMMON

Earthquakes in Japan

IN the one hundred and seventy-first volume of the "Konrui Shinko-Kushi," one of the oldest and finest works on Ancient Japan, there are tables giving the number, intensity, and remarkable characteristics of all the earthquakes which occurred in Japan between the years 416 and 886 A.D. Unfortunately, the few extant copies of this most important compilation are all more or less in a fragmentary condition. It is, however, evident from the context that the author intended to, or actually did, enumerate many more of these natural phenomena, and it is highly probable that many of his original notes have been lost with the rest; but even as it stands the work is of undoubted importance, now that the Seismological Society of Japan has been doing all in its power to bring forth the ancient records which refer to the great earthquakes of the past. As every one knows, Japan is the very hearth of earthquakes; in 1854 more than 60,000 people lost their lives in consequence of one of these great terrestrial catastrophes, and it has been calculated that from ten to twelve earthquakes, each lasting several seconds, occur every year, besides numerous others of too slight a nature to be worthy of remark.

The earthquakes mentioned in the work under consideration begin with that which took place in the fifth year after the coronation of Inkio Tenno (A.D. 416), and end with the one in the fifth year of Koko Tenno (A.D. 886). Earthquakes occurred during this period of 470 years on 640 days, but that by no means gives the probable total. It seems that those which are noted on the 640 days were all of sufficient importance to deserve particular mention. The great care taken by the compiler in his tables is evident from the fact that the exact date and time of each earthquake is given. Kiyoto was then the capital of Japan, and most of the earthquakes mentioned took place in the then Imperial City, 626 out of the total 640. Those not felt in Kiyoto are spoken of only when unusually intense, in which case the exact locality and amount of damage caused are given. Quite recently the vernacular Japanese press, in consequence of some lately published returns bearing on the subject, has devoted considerable attention to investigating the annals of the "Konrui-Shinko-Kushi," in hopes of being able to ascertain if earthquakes of certain intensity recur at certain periods, in fact, they have attempted to prove that earthquakes run in well-defined cycles. This is by no means a novel nor even very modern idea. Wernich, in his "Geographische-medicinische Studien," says that severe earthquakes occur in Japan every twenty years. In a footnote he adds:—"I am unable to adduce any natural or physical proofs in behalf of this hypothesis. And yet the Japanese earthquakes can be very readily explained by the theory of 'periodical phenomena.' They are commonest at the times of the highest tides, and in the months of January, April, and October."

Whatever may be the truth of the suppositions and theories, the Japanese journals, both the scientific and the dailies, have gone to work by accepting the periodicity of these phenomena. Taking ten years as the divisor, they divide the time between A.D. 628 (when the records begin to be more trustworthy) and A.D. 886 into twenty-six periods. The following table is the result:—

Periods	Earthquake days	Periods	Earthquake days	Periods	Earthquake days
1	0	10	6	19	3
2	3	11	5	20	56
3	0	12	29	21	39
4	1	13	3	22	18
5	2	14	0	23	104
6	15	15	11	24	87
7	1	16	22	25	95
8	0	17	10	26	100
9	3	18	9		

It is very evident from the foregoing that the records are far from being as exact as could be desired with regard to the earlier centuries, or else that the physical condition of the country in 886 was totally different from that of 628 A.D. But to return to the table, it will be seen that the intervals between the periods in which earthquakes were most frequent are as follows:—40 years between the 2nd and 6th periods, 60 years between the 6th and 12th, 40 years between the 12th and 16th, 40 years between the 16th and 20th, and 30 years between the 20th and 23rd. Acting on the supposition that one period of unusual frequency of earthquakes has been left unrecorded, the average length of the intervals is estimated at 35 years. Following the author's explanatory notes, a still more correct table can be deduced, by means of which the cycle of earthquake intensity is finally put at 33·3 years. A further deduction is made that earthquakes of a disastrous nature occur once every 59 years, so the next great catastrophe may be expected in 1913.

As the notes of the compiler give the date of each earthquake between the above-mentioned years, it appears that earthquakes used formerly to be most frequent in August, most severe in May and November, and followed or preceded by violent hurricanes, electric storms, and the like in January; 55 per cent. of all Japanese earthquakes occurring during the warm season.

Yokohama F. WARRINGTON EASTLAKE

"Udschimya sericaria," Rond., a Fly Parasitic on the Silkworm

I HAVE been engaged during the past year in tracing the life-history of *Udschimya sericaria*, Rond., and have succeeded in making it out completely. I send you a short account of it, hoping that it may not be entirely uninteresting to your readers. As you are no doubt aware, in Japan and China the maggot of this fly does great damage every year to the larvæ and pupæ of the silkworm, sometimes 80 per cent. of the caterpillars and pupæ being killed. The knowledge of its life-history would therefore be of great economic interest as furnishing the scientific basis for guarding against this parasite. Strange as it may seem, no one has, however, until recently, made any systematic observations on the matter.

In 1874 my father, Mr. N. Sasaki, who was the first to study this insect, found its larva in the main trunk of the trachea of the silkworm, just inside the stigma, and finally concluded that the

maggot gained this place by entering through the stigma from outside.

My investigations extend from April 1883 to June of this year, and are briefly summed up as follows:—

Udschimya sericaria appears generally in the middle of April, and attains maturity in the beginning of May, at the time when mulberry-trees expand their spring leaves. The female flies, flying in bushes of mulberry-trees during the months of May and June, deposit their eggs on the under surface of the leaves in close contact with the mid-rib, or else with the fine ramified veins.

The eggs are nearly oval in shape, tapering at one end, and rounded at the other. They are very small in size, measuring 0·18 mm. in length, and 0·13 mm. in breadth, and generally convex on the upper and flat on the under surface. The upper convex surface, which is coloured blackish-brown, has a lustre, and is marked out into hexagonal areas; while the lower flat surface, which is coloured grayish-brown, lacks lustre, and is only faintly marked out into hexagonal areas. The whole egg is enveloped with a sticky substance, which fixes it firmly with its flat side on the under surface of the leaves.

When the leaves on which the eggs are thus deposited are given to the silkworms, they eat them whole along with the leaves, without crushing them at all. At one to six hours after the eggs are taken, they are hatched out near either end of the digestive canal, and a tiny white maggot comes into existence. After a while the maggot passes out of the alimentary canal through the mucous membrane, with the aid of its horny hooked tooth and of setæ provided on each segment, and enters directly into one of the nervous ganglia found just under the digestive canal. A thin transparent membrane which envelops the ganglion becomes a protecting sac, inside which the maggot lives, and takes nerve-cells as its food. As it grows in size, this sac gradually enlarges, and finally rupturing, the maggot passes out into the body-cavity. At this time it measures five to six millimetres in length.

The maggot now seeks the main stem of the trachea, which forms a kind of chamber just inside the stigma of the silkworm, and enters into it by making an opening with its hooked tooth. It now sticks its head out into the body-cavity of the silkworm through the opening by which it entered, and takes fat as its food. Its posterior end, which is provided with two large spiracles, is directed towards the stigma, and thus the maggot respires the air which passes in through the latter.

As the maggot grows, this newly-formed chamber in which it rests also becomes larger, and the opening through which the anterior end of the maggot is projected out into the body-cavity of the silkworm becomes wider and wider, until the chamber assumes the shape of a cup Around this cup a large amount of fat is fixed by the maggot, probably with a watery fluid it secretes of alkaline reaction, and thus the wall of the cup increases in thickness and becomes very tough. The wall is always coloured dark brown, owing probably to the fæces of the parasite and to the action of the secretion upon the fat in the wall of the cup. In this position the maggot attains maturity; it then crawls out through an opening it makes at any portion of the body of its host. If, however, the growth of the maggot has been slow, it may be found in the trachea of the silkworm after it has changed into a pupa.

In either case, whether the larvæ or the pupæ have the parasite in the trachea, the space around the stigma, inside which the maggot is lodged, is always marked with a large dark brown patch, so that the presence of the maggot is easily recognised by looking at the stigma.

If a larva or a pupa of the silkworm is once infested by this parasite, its fate is sealed, and the cocoons made by the infested caterpillars are usually thin, and of much less value.

Those maggots which become mature in the pupæ of the silkworm crawl out of the cocoon by making a round opening at one pole, and such perforated cocoons are entirely useless for reeling silk.

The mature free maggot, coloured light yellow, is very active, and searching for the corner of the case in which they are kept, or crawling deep into the ground, changes soon into a black, cylindrical pupa. There the pupa rests through the winter, and in the following spring a perfected fly hatches out by breaking open the pupa-case.

A detailed account with suggestions for the remedies will soon be published in a *Memoir* of the University of Tokio.

C. SASAKI

University of Tokio, July

Singular Instance of Instinct

AMONG the insects very common to Victoria is one popularly known as the mason-fly. In form it is very like a gigantic hornet; the wings and legs are of an orange colour, as is also the abdomen, which is decorated with broad black stripes. It has a strange habit of building its nest, composed of tempered mud, in keyholes. Mr. Ellery, F.R.S., the Government Astronomer, tells me that this same fly often commences to build within the tubes of their astronomical instruments. The nest is rather peculiar. A layer of mud is first laid down, and a certain number of eggs are laid. Then follows another layer of mud; on this are deposited a number of young spiders, paralysed but not killed. Another layer of mud, more eggs, then mud, then spiders again, and so on, until the nest is complete. The spiders are evidently stored up as food for the grubs, as soon as hatched, an arrangement already known to naturalists. This fly has a very fierce aspect, and its nature evidently does not belie its looks. It flies about with great liveliness, and when alighting, its long black antennæ are kept in a state of constant motion. Its favourite food seems to be spiders, which it is in the habit of seeking for under the bark and in holes in the trunk of the Eucalyptus. It order to catch them it burrows under the loose bark, and in a few seconds generally issues forth again with some larger or smaller prey between its mandibles. The enormous bulk of some of the victims does not appear to intimidate it in the least. Even the gigantic so-called tarantula (vulgarly triantelope) is fearlessly attacked. I was one day walking through a suburban park near Melbourne, and saw one of these flies suddenly pounce down on the back of a large tarantula some five inches in breadth, measuring from the ends of the legs. The huge arachnidian succumbed at once. Resistance with an adversary in such a position was altogether out of the question, the only resource being to die, like Cæsar, becomingly. I watched the fight, or rather the murder, for some minutes, and then touching the assailant with the point of my umbrella, drove it away. It only flew, however, to a short distance, and then returned, flying so viciously round that I fully expected I should be attacked. By flourishing the umbrella, however, I again drove it off, and it retired to a distance of about a hundred feet. I then left the spider, but afterwards went back, and found the mason-fly following up his victory as energetically as ever. I drove it away again, left the spot, and again returned to find the murderous work still going on. This was repeated some half a dozen times, and at last, taking out a book, I sat down on a seat resolving to see what would happen. The fly did not reappear for nearly a quarter of an hour, and I thought it had altogether departed. A small ditch ran beside the pathway, and, turning my eyes in that direction, I noticed the mason-fly peeping through some blades of grass growing on the edge. It was evidently waiting for me to leave the spot in order to secure the full advantages of its victory.

It may be mentioned that the tarantula is a great coward. Some of our large spiders, if placed on an ants' nest, will "run amuck" through the crowd, nipping with their immense mandibles scores of their assailants who may approach them. They will do this several times in succession, and generally get away. The tarantula, however, if placed in such a position, yields at once, and, gathering up its long legs, expires with all dignity. I have tried the experiment many times, when a run of six inches would have secured the freedom of the tarantula, but even in these cases no effort was ever made to escape. One species of spider, living under the bark of trees, the skin of the abdomen of which is very soft, often proves a match for the ants, not by fighting, but by stratagem. He plays his enemies a thoroughly Parthian trick, throwing out a number of webs, which completely entangle them. This same spider, if thrown into a pool of water, similarly throws out threads of web, and, these being wafted to the shore, and adhering to an overhanging branch, enable the spider to reach the land.

THOMAS HARRISON

244, Victoria Parade, East Melbourne, Victoria, July 9

Przevalsky's Horse

IT seems worth while to point out the close resemblance between the figure of this horse in NATURE for August 21 and those found incised on antlers in the cave of La Madelaine, copied in Dawkins' "Early Man." There is the same massive head, the same hog-mane, absence of forelock, pointed ears, short body, and powerful legs, while there seems even an indication that the long hairs of the tail spring first from the middle of that